Lund et al. Journal of Cardiovascular Magnetic Resonance 2013, 15(Suppl 1):P179
http://www.jcmr-online.com/content/15/S1/P179

Journal of Cardiovascular Magnetic Resonance

POSTER PRESENTATION Open Access

Serial T2-mapping to quantitatively monitor resorption of myocardial edema following acute myocardial infarction

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From 16th Annual SCMR Scientific Sessions
San Francisco, CA, USA. 31 January - 3 February 2013

Background

Currently, myocardial edema monitoring after acute myocardial infarction (AMI) is based on visualization of the region with increased signal-intensity on T2-weighted images. T2-mapping is a promising novel cardiac magnetic resonance imaging (CMR) technique to quantitatively assess myocardial edema. The purpose of the study was to quantitatively evaluate resorption of myocardial edema following AMI using T2-mapping.

Methods

CMR (1.5 Tesla Philips Achieva) was performed in 20 patients within seven days after a reperfused AMI (Baseline) and at one, three and six months follow-up, respectively. A free-breathing, navigator-gated multi-echo sequence was used for T2-mapping. T2-maps were calculated from fifteen echoes using a dedicated plug-in written for OsiriX software. Serial T2 values were assessed using a six-segment model (Figure). Infarcted and remote segments were defined by using information from corresponding late-enhancement images (Figure).

Results

A significant decrease of the T2 time was found in infarcted segments from baseline to one month follow-up (82±19 vs. 70±7 ms; $p<0.05$), but not between one and three (70±7 vs. 62±8; p=ns) or three and six (62±8 vs. 62 ±5 ms; p=ns) month follow-up. Identical T2 times were found in remote segments at baseline, one, three and six month follow-up (61±6 vs. 61±5 vs. 59±7 vs. 58±2 ms; p=ns). The T2infarct/T2remote ratio decreased from baseline to one month follow-up (1.34±0.26 vs. 1.15±0.10; $p<0.05$) and from one to three month follow-up (1.15 ±0.10 vs. 1.04±0.06; p=0.05). No significant change was found for the T2infarct/T2remote ratio from three to six month follow-up (1.04±0.06 vs. 1.07±0.09; p=ns).

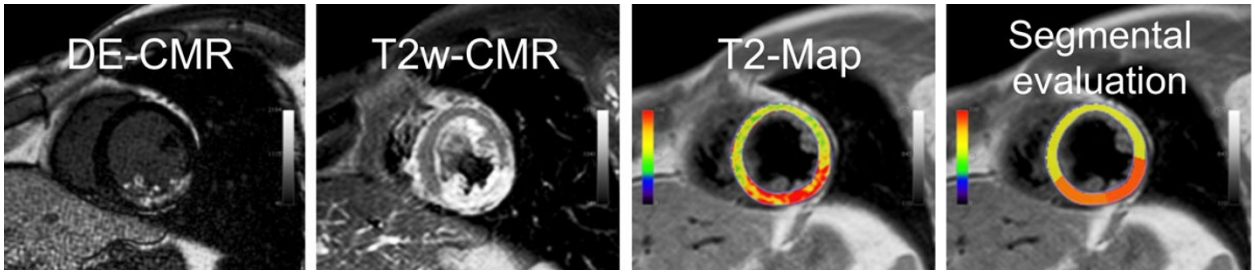

Figure 1 CMR of a patient with acute posterior infarction. The infarct and the myocardial edema is seen on the DE- and the T2w-CMR, respectively. The T2-Map shows increased T2 time in the infarcted area. A segmental evaluation was performed in six segments.

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Conclusions

Serial T2-mapping enables monitoring of edema resorption following acute myocardial infarction. The magnitude of edema resorption occurs in the first month after AMI and the T2 values normalize within 3 months after AMI. Thereafter, no further T2 time reduction is observed.

Funding

None

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Published: 30 January 2013

doi:10.1186/1532-429X-15-S1-P179
Cite this article as: Lund *et al.*: Serial T2-mapping to quantitatively monitor resorption of myocardial edema following acute myocardial infarction. *Journal of Cardiovascular Magnetic Resonance* 2013 **15**(Suppl 1): P179.